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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/595,518	06/16/2000	Eric Douglas Romesburg	1280.00180	9785

7590 10/06/2003

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ART UNIT	PAPER NUMBER
2644	5

DATE MAILED: 10/06/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/595,518	ROMESBURG, ERIC DOUGLAS	
	Examiner	Art Unit	
	Walter F Briney III	2644	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 June 2000* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-52* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8,10-21,23-36,38-48 and 50-52* is/are rejected.

7)☒ Claim(s) *9,22,37 and 49* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *16 June 2000* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 16 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 16 recites the limitation "the communications system" in line 1 of the claim. There is insufficient antecedent basis for this limitation in the claim.

For the purpose of this Office Action, examiner assumes the limitation is intended to read, "the communications device is in a cellular system".

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-8, 10-14, 17-21, 23-29, 31-36, 38-41, 44-48, and 50-52 are rejected under 35 U.S.C. 103(a) as being unpatentable over Laberteaux (US Patent 6,031,908) in view of Sih (US Patent 5,559,881) and in further view of Vähätalo (US Patent 5,737,410).

Claim 1 is limited to **a method for canceling echo for a communications device comprising: storing an existing filter coefficient set**; Laberteaux discloses setting a non-adaptive filter to a default coefficient set (figure 3, step 80 and column 4, lines 60-62). **Periodically calculating a trial filter coefficient set**; Laberteaux discloses adapting the coefficients of an adaptive filter (i.e. trial filter) (column 4, line 66 through column 5, line 6). **Processing an echo-containing signal over a predetermined time period using the existing filter coefficient set to provide a first echo-canceled output signal**; Laberteaux discloses a non-adaptive echo canceller with enough taps to process the length of an echo (i.e. predetermined time period) that uses its loaded coefficients (i.e. existing filter set) to produce an echo replica that is subtracted from an input with echo to produce echo compensated signals (i.e. echo-cancelled outputs) (column 3, line 65 through column 4, line 14). **Processing an echo-containing signal over the predetermined time period using the trial filter coefficient set to provide a trial echo-cancelled output signal**; Laberteaux discloses an adaptive filter (i.e. trial filter) with enough taps to process the length of an echo (i.e. predetermined time period) that uses its coefficients to provide an echo compensated signal (column 3, line 65 through column 4, line 14). Laberteaux discloses calculating ERLE values involving both the adaptive and non-adaptive filter outputs (column 4, lines 38-57), and discloses that ERLE are averaged over a predetermined number of samples (column 4, lines 54-57 and column 5, lines 7-18). Therefore, Laberteaux has been shown to disclose all limitations of the claim with the exception of **calculating a first energy value of the first echo-canceled output over the predetermined time**

period; calculating a trial energy value of the first echo-canceled output over the predetermined time period; calculating a trial energy value of the trial echo-canceled output over the predetermined time period; Sih teaches that ERLE represents the amount of energy that is removed from the echo after it is passed through the echo canceller and should be calculated using short-term energy averages over the value N, which represents the filter order (i.e. predetermined time period) (column 8, lines 27-55 and column 6, line 63). It would have been obvious to one of ordinary skill in the art at the time of the invention to perform energy calculation of the echo-cancelled output signals of Laberteaux using ERLE with short-term energy averages as taught by Sih for the purpose of providing the preferred averaging method of ERLE calculation of Laberteaux. Therefore, Laberteaux in view of Sih have been shown to make obvious all limitations of the claim with the exception of **determining if the echo-containing signal is dominated by echo**; Vähätalo teaches correlating a signal outgoing to a signal path and a returned echo (i.e. echo-containing signal) to determine if an echo exists on the returned echo based on the location of a high correlation between the signal outgoing to the echo path and the returned echo. When the peak of the echo is found, an adaptive filter is centered on the peak of an echo so fewer filter taps are required to perform an echo cancellation. It would have been obvious to one of ordinary skill in the art at the time of the invention to correlate the near-end speech with echo and the far-end speech of Laberteaux as taught by Vähätalo for the purpose of centering the filters around the peak of the echo to reduce the required number of filter taps to perform echo cancellation. **Updating the existing**

filter coefficient set with the trial coefficient set where the echo-containing signal is dominated by echo and the trial energy is less than the first energy; Laberteaux discloses transferring the adaptive filter's (i.e. trial) coefficients to the non-adaptive filter (i.e. existing) coefficients when the ERLE of the adaptive filter is greater than the ERLE of the non-adaptive filter. Because ERLE measurements are inversely proportional to energy (Sih, equations 6, 7, and 8), this corresponds to transferring the coefficients when the adaptive filter's error output is less than the non-adaptive filter's error output. Laberteaux also discloses performing the transfer of coefficients only when the ERLE of the adaptive filter is greater than any previous ERLE recorded. Thus, the transfer will occur when the filter is removing echo that is dominating the input signal better than any other configuration used. Therefore, Laberteaux in view of Sih and in further view of Vähätalo makes obvious all limitations of the claim.

Claim 2 is limited to **the method of claim 1**, as covered by Laberteaux in view of Sih and in further view of Vähätalo, **wherein the step of processing the echo-containing signal to provide the first echo-canceled output signal comprises: filtering an echo-causing signal using the existing filter coefficient set to provide an estimate of the echo component**; Laberteaux discloses using the non-adaptive filter to produce a signal s<bar>, which is the same as a prior art echo canceller's echo estimate signal (column 2, lines 27-34). **Subtracting the estimate of the echo component from the echo-containing signal to provide the first echo-canceled output signal**; Laberteaux discloses subtracting this signal from a signal-plus-echo to produce an echo-cancelled output e<bar> (column 4, lines 9-13). Therefore,

Laberteaux in view of Sih and in further view of Vähätalo makes obvious all limitations of the claim.

Claim 3 is limited to **the method of claim 1**, as covered by Laberteaux in view of Sih and in further view of Vähätalo, **wherein the step of processing the echo-containing signal to provide the trial echo-canceled output signal comprises: filtering an echo-causing signal using the trial filter coefficient set to provide an estimate of the echo component**; Laberteaux discloses using the adaptive filter to produce a signal s<hat>, which is an echo estimate signal, like s<bar>, but is produced with an adaptive filter (column 2, lines 48-52). **Subtracting the estimate of the echo component from the echo-containing signal to provide the trial echo-canceled output signal**. Laberteaux discloses subtracting this signal from a signal-plus-echo to produce an echo-cancelled output e<hat> (column 4, lines 9-13). Therefore, Laberteaux in view of Sih and in further view of Vähätalo makes obvious all limitations of the claim.

Claim 4 is limited to **the method of claim 1**, as covered by Laberteaux in view of Sih and in further view of Vähätalo, **wherein the step of determining if the echo-containing signal is dominated by echo comprises: capturing a predetermined number of samples of an echo-causing signal and the echo-containing signal over the predetermined time period**; Vähätalo discloses sampling the incoming (i.e. echo-causing) and outgoing (i.e. echo-containing) signals (column 4, lines 9-12) so enough samples exist to model the echo pathway (column 5, lines 47-49). **Calculating a correlation function between the echo-containing signal and the echo-causing**

signal over a correlation window; Vähätalo discloses using these sample vectors to calculate a correlation in a window (Abstract). **Calculating a first value using the correlation function over a portion of the correlation window where echo is expected**; Vähätalo discloses calculating a highest sum that is a sum of correlation results, and where this maximum sum occurs echo is expected to be present (column 4, lines 4-44). **Calculating a second value using the correlation function over a portion of the correlation window where no echo is expected**; Vähätalo discloses that after finding the highest sum, those values are set to zero, and a second value is calculated, and that sum should be lower than the previous sum because the echo should have been set to zero, thus no echo is expected where this second sum is calculated (column 4, lines 4-44). **Computing a status indicator as a function of the first value and the second value, the status indicator used for determining whether the echo-containing signal is dominated by echo**; Vähätalo discloses that when a first calculation is made showing the center of an echo and a second calculation is sufficiently lower than the first (i.e. status indicator) proving the center of an echo (i.e. determining domination by echo). Therefore, Laberteaux in view of Sih and in further view of Vähätalo makes obvious all limitations of the claim.

Claim 5 is limited to **the method of claim 4**, as covered by Laberteaux in view of Sih and in further view of Vähätalo, **wherein the portion of the correlation window where no echo is expected is a last ½ of the correlation window, and the step of calculating the second value comprises calculating the second value from the last ½ of the correlation window**; Vähätalo disclose that the echo is determined in a

correlation window, and echo can occur in any part of the window such that a lack of echo can also exist anywhere (i.e. last ½), the correlation function calculates a second value across the entire window. Therefore, Laberteaux in view of Sih and in further view of Vähätalo discloses all limitations of the claim.

Claim 6 is limited to **the method of claim 4**, as covered by Laberteaux in view of Sih and in further view of Vähätalo, **wherein the portion of the correlation window where no echo is expected is a last ¼ of the correlation window, and the step of calculating the second value comprises calculating the second value from the last ¼ of the correlation window**; Vähätalo disclose that the echo is determined in a correlation window, and echo can occur in any part of the window such that a lack of echo can also exist anywhere (i.e. last ¼), the correlation function calculates a second value across the entire window. Therefore, Laberteaux in view of Sih and in further view of Vähätalo discloses all limitations of the claim.7

Claim 7 is limited to **the method of claim 4 wherein the portion of the correlation window where echo is expected is a first ½ of the correlation window, and the step of calculating the first value comprises calculating the first value from the first ½ of the correlation window using the correlation function**; Vähätalo disclose that the echo is determined in a correlation window, and echo can occur in any part of the window (i.e. first ½), the correlation function calculates the peak from across the entire window (i.e. first ½). Therefore, Laberteaux in view of Sih and in further view of Vähätalo discloses all limitations of the claim.

Claim 8 is limited to **the method of claim 4**, as covered by Laberteaux in view of Sih and in further view of Vähätalo, **wherein the first value is peak magnitude, and the step of calculating the peak magnitude comprises determining a maximum value of the correlation function during the portion of the correlation window where echo is expected**; Vähätalo discloses that the first value is a highest sum of correlation results and after analyzing each portion of the correlation window the highest sum recorded is the peak and is where the center of an echo is expected to be (column 4, lines 4-44). Therefore, Laberteaux in view of Sih and in further view of Vähätalo makes obvious all limitations of the claim.

Claim 10 is limited to **the method of claim 1**, as covered by Laberteaux in view of Sih and in further view of Vähätalo. **Wherein the step of determining if the echo-containing signal is dominated by echo comprise: capturing a predetermined number of samples of an echo-causing signal and the first echo-canceled output signal over the predetermined time period**; Vähätalo discloses sampling the incoming (i.e. echo-causing) and outgoing (i.e. echo-containing) signals (column 4, lines 9-12) so enough samples exist to model the echo pathway (column 5, lines 47-49). **Calculating a correlation function between the first echo-canceled output signal and the echo-causing signal over a correlation window**; Laberteaux discloses calculating an ERLE (i.e. correlation) that is based off the filter output e<bar> that comes from the non-adaptive filter and the signal Y, which is derived directly from the echo-causing signal, where ERLE is calculated as an average (i.e. window) (column 4, lines 38-57). **Calculating a first value using the correlation function over a portion**

of the correlation window where echo is expected; Laberteaux discloses calculating an ERLE over an average that would inherently include a portion of the window where echo is expected (column 4, lines 54-57). **Calculating a second value using the correlation function over a portion of the correlation window where no echo is expected**; Laberteaux discloses calculating an ERLE over an average that would inherently include a portion of the window where echo is expected and a second value where the number of samples in the average is greater than one (column 4, lines 54-57). **Computing a status indicator as a function of the first value and the second value, the status indicator used for determining whether the echo-containing signal is dominated by echo**; Laberteaux discloses calculating an average (i.e. status) that uses all values including a first and second where the number of samples is greater than one to determine how much echo exists in a signal. Therefore, the prior art makes obvious all limitations of the claim.

Claim 11 is limited to **the method of claim 1**, as covered by Laberteaux in view of Sih and in further view of Vähätalo, **further comprising: capturing a predetermined number of samples of an echo-causing signal and the echo-containing signal**; the far-end (i.e. echo causing) signal and the near-end (i.e. echo-containing) signal are inherently sampled by the digital FIR filters in the adaptive and non-adaptive filters, where the number of samples is determined based on the length of the filters. **Wherein the step of processing the echo-containing signal to provide the first echo-canceled output signal comprises processing the echo-containing signal for each of the predetermined number of samples of the echo-causing**

signal and the echo-containing signal, and providing a corresponding first echo-canceled output signal for each sample; Laberteaux discloses filtering the far-end signal and applying it to a near-end signal using the non-adaptive filter for each tap in the filter thus creating an echo compensated signal (column 4, lines 9-16). **The step of calculating the first energy value comprises summing the squares of the first echo-canceled output signal for each of the corresponding first echo-canceled output signal samples over the predetermined time period**; Laberteaux discloses calculating ERLE values based on echo canceller outputs, Sih discloses calculating ERLE using short-term energy averages that involve a sum of squares of the echo-canceled output (column 8, line 27-41 and equation 8). Therefore, Laberteaux in view of Sih and in further view of Vähätalo makes obvious all limitations of the claim.

Claim 12 is limited to **the method of claim 1**, as covered by Laberteaux in view of Sih and in further view of Vähätalo, **further comprising: capturing a predetermined number of samples of an echo-causing signal and the echo-containing signal**; the far-end (i.e. echo causing) signal and the near-end (i.e. echo-containing) signal are inherently sampled by the digital FIR filters in the adaptive and non-adaptive filters, where the number of samples is determined based on the length of the filters. **Wherein the step of processing the echo-containing signal to provide the trial echo-canceled output signal comprises processing the echo-containing signal for each of the predetermined number of samples of the echo-causing signal and the echo-containing signal, and providing a corresponding trial echo-canceled output signal for each sample**; Laberteaux discloses filtering the far-end

signal using the adaptive filter and applying it to a near-end signal for each tap in the filter thus creating an echo compensated signal (column 4, lines 9-16). **The step of calculating the trial energy value comprises summing the square of the trial echo-canceled output signal for each of the corresponding trial echo-canceled output signal samples over the correlation window**; Laberteaux discloses calculating ERLE values based on echo canceller outputs, Sih discloses calculating ERLE using short-term energy averages that involve a sum of squares of the echo-canceled output (column 8, line 27-41 and equation 8). Therefore, Laberteaux in view of Sih and in further view of Vähätalo makes obvious all limitations of the claim.

Claim 13 is limited to **the method of claim 1**, as covered by Laberteaux in view of Sih and in further view of Vähätalo, **further comprising: capturing a predetermined number of samples of an echo-causing signal and the echo-containing signal;** the far-end (i.e. echo causing) signal and the near-end (i.e. echo-containing) signal are inherently sampled by the digital FIR filters in the adaptive and non-adaptive filters, where the number of samples is determined based on the length of the filters. **Wherein the step of processing the echo-containing signal to provide the trial echo-canceled output signal comprises processing the echo-containing signal for each of the predetermined number of samples of the echo-causing signal and the echo-containing signal using the trial filter coefficient set, and providing a corresponding trial echo-canceled output signal for each sample**; Laberteaux discloses filtering the far-end signal using the adaptive filter and applying it to a near-end signal for each tap in the filter thus creating an echo compensated signal

(column 4, lines 9-16). Laberteaux discloses updating the adaptive filter (i.e. trial filter) based on a value a_n that stands for the adaptation gain and is affected by double-talk conditions. **Modifying the trial filter coefficient set responsive to each sample of the corresponding trial echo-canceled output signal**; Laberteaux discloses updating the adaptive filter if the ERLE of the adaptive filter fails to meet condition 120 of figure 3 where the ERLE is calculated as covered by Laberteaux in view of Sih using an average of all samples. Therefore, Laberteaux in view of Sih in further view of Vähätalo makes obvious all limitations of the claim.

Claim 14 is limited to **the method of claim 1**, as covered by Laberteaux in view of Sih and in further view of Vähätalo, **further comprising: modifying the trial filter coefficient set after the predetermined time period**; the adaptive filter (i.e. trial filter) is updated inherently over a course of time which has to include the length of an echo path (i.e. predetermined time period). Therefore, Laberteaux in view of Sih and in further view of Vähätalo makes obvious all limitations of the claim.

Claim 17 is essentially the same as claim 4 and is rejected for the same reasons as of claim 4.

Claim 18 is essentially the same as claim 5 and is rejected for the same reasons as of claim 5.

Claim 19 is essentially the same as claim 6 and is rejected for the same reasons as of claim 6.

Claim 20 is essentially the same as claim 7 and is rejected for the same reasons as of claim 7.

Claim 21 is essentially the same as claim 8 and is rejected for the same reasons as of claim 8.

Claim 23 is limited to **the method of claim 17 wherein at least one of the first value and the second value used to compute the status indicator is proportional to an energy value of one of the first and second portions of the correlation window calculated by summing the squares of the correlation function over the one portion**; the maximum value calculated by Vähätalo is done buy summing the squares of the portion of the window in which it is calculated (column 4, lines 4-44). Therefore, Laberteaux in view of Sih and in further view of Vähätalo makes obvious all limitations of the claim.

Claim 24 is limited to **the method of claim 17 wherein at least one of the first value and the second value used to compute the status indicator is proportional to a norm of one of the first and second portions of the correlation window calculated by taking the square root of the sum of the squares of the correlation function over the one portion**; the maximum value calculated by Vähätalo is done by summing the squares, which is proportional to the square root of the sum of the squares of the portion of the window in which it is calculated (column 4, lines 4-44). Therefore, Laberteaux in view of Sih and in further view of Vähätalo makes obvious all limitations of the claim.

Claim 25 is limited to **an echo canceller for a communications system comprising: an echo-containing signal input for receiving a signal**; Laberteaux discloses a near-end signal that has echo (figure 2, element Y). **An echo-causing**

signal source for developing an echo-causing signal; Laberteaux discloses a far-end signal that causes echo (figure 2, element X). **A first filter coupled to the echo-containing signal input and the echo-causing signal source for processing the echo-containing signal over a predetermined time period using an existing filter coefficient set to provide a first echo-canceled output signal at a first filter output node**; Laberteaux discloses a filter h<bar> that receives signal Y and X and creates output e<bar> for each tap of a FIR filter (i.e. predetermined time period) (column 4, lines 8-17). **A trial filter coupled to the echo-containing signal input and the echo-causing signal source for processing the echo-containing signal over a predetermined time period using a trial filter coefficient set to provide a trial echo-canceled output signal at a trial filter output node**; Laberteaux discloses a filter h<hat> that receives signal Y and X and creates output e<hat> for each tap of a FIR filter (i.e. predetermined time period) (column 4, lines 8-17). **A controller coupled to the echo-containing signal input, the echo-causing signal source, the first filter output node, and the trial filter output node**; Laberteaux discloses both filters h<bar> and h<hat> and controller (figure 3, element 65) with inputs for signal Y, X, e<bar>, and e<hat> (column 4, lines 18-26). **Periodically recalculating the trial coefficient set**; Laberteaux discloses an adaptive filter that recalculates its coefficients (column 4, line 66 through column 5, line 6). Therefore, Laberteaux has been shown to disclose all limitations of the claim with the exception of **calculating a first energy value of the first echo-canceled output signal over the predetermined time period, calculating a trial energy value of the trial echo-canceled output signal over the**

predetermined time period; Sih teaches that ERLE represents the amount of energy that is removed from the echo after it is passed through the echo canceller and should be calculated using short-term energy averages over the value N, which represents the filter order (i.e. predetermined time period) (column 8, lines 27-55 and column 6, line 63). It would have been obvious to one of ordinary skill in the art at the time of the invention to perform energy calculation of the echo-cancelled output signals of Laberteaux using ERLE with short-term energy averages as taught by Sih for the purpose of providing the preferred averaging method of ERLE calculation of Laberteaux. Therefore, Laberteaux in view of Sih has been shown to disclose all limitations of the claim with the exception of **Determining if the echo-containing signal is dominated by echo**; Vähätalo teaches correlating a signal outgoing to a signal path and a returned echo (i.e. echo-containing signal) to determine if an echo exists on the returned echo based on the location of a high correlation between the signal outgoing to the echo path and the returned echo. When the peak of the echo is found, an adaptive filter is centered on the peak of an echo so less filter taps are required to perform an echo cancellation. It would have been obvious to one of ordinary skill in the art at the time of the invention to correlate the near-end speech with echo and the far-end speech of Laberteaux as taught by Vähätalo for the purpose of centering the filters around the peak of the echo to reduce the required number of filter taps to perform echo cancellation. **Updating the existing filter coefficient set with the trial coefficient set where the echo-containing signal is dominated by echo and the trial energy is less than the first energy**. Laberteaux discloses transferring

the adaptive filter's (i.e. trial) coefficients to the non-adaptive filter (i.e. existing) coefficients when the ERLE of the adaptive filter is greater than the ERLE of the non-adaptive filter. Because ERLE measurements are inversely proportional to energy (Sih, equations 6, 7, and 8), this corresponds to transferring the coefficients when the adaptive filter's error output is less than the non-adaptive filter's error output. Laberteaux also discloses performing the transfer of coefficients only when the ERLE of the adaptive filter is greater than any previous ERLE recorded. Thus, the transfer will occur when the filter is removing echo that is dominating the input signal better than any other configuration used. Therefore, Laberteaux in view of Sih and in further view of Vähätalo makes obvious all limitations of the claim.

Claim 26 is essentially the same as claim 15 and is rejected for the same reasons as of claim 15.

Claim 27 is essentially the same as claim 2 and is rejected for the same reasons as of claim 2.

Claim 28 is essentially the same as claim 3 and is rejected for the same reasons as of claim 3.

Claim 29 is essentially the same as claim 11 and is rejected for the same reasons as of claim 11.

Claim 31 is essentially the same as claim 12 and is rejected for the same reasons as of claim 12.

Claim 32 is essentially the same as claim 4 and is rejected for the same reasons as of claim 4.

Claim 33 is essentially the same as claim 5 and is rejected for the same reasons as of claim 5.

Claim 34 is essentially the same as claim 6 and is rejected for the same reasons as of claim 6.

Claim 35 is essentially the same as claim 7 and is rejected for the same reasons as of claim 7.

Claim 36 is essentially the same as claim 8 and is rejected for the same reasons as of claim 8.

Claim 38 is essentially the same as claim 30 and is rejected for the same reasons as of claim 30.

Claim 39 is essentially the same as claim 10 and is rejected for the same reasons as of claim 10.

Claim 40 is essentially the same as claim 13 and is rejected for the same reasons as of claim 13.

Claim 41 is essentially the same as claim 14 and is rejected for the same reasons as of claim 14.

Claim 44 is essentially the same as claim 17 and is rejected for the same reasons as of claim 17.

Claim 45 is essentially the same as claim 5 and is rejected for the same reasons as of claim 5.

Claim 46 is essentially the same as claim 6 and is rejected for the same reasons as of claim 6.

Claim 47 is essentially the same as claim 7 and is rejected for the same reasons as of claim 7.

Claim 48 is essentially the same as claim 17 and is rejected for the same reasons as of claim 8.

Claim 50 is essentially the same as claim 30 and is rejected for the same reasons as of claim 30.

Claim 51 is essentially the same as claim 23 and is rejected for the same reasons as of claim 23.

Claim 52 is essentially the same as claim 24 and is rejected for the same reasons as of claim 24.

Claims 16, 30, 42 and 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Laberteaux in view of Sih and in further view of Vähätalo as applied to claims 1 and 25 above, and further in view of Pon et al. (US Patent 6,185,424).

Claim 16 is limited to **the method of claim 1**, as covered by Laberteaux in view of Sih and in further view of Vähätalo, **wherein the communications system is a cellular system utilizing a Time Division Multiple Access (TDMA) architecture, and the predetermined time period is a TDMA time frame**; Pon teaches to use echo canceling in a TDMA system for the purpose of removing echo in a mobile-to-mobile connection (column 1, line 53 through column 2, line 27) where the period of filtering is performed in a TDMA time frame (column 8, line 61 through column 9, line 4). It would have been obvious to one of ordinary skill in the art at the time of the invention to adopt the echo canceling system of Laberteaux in view of Sih and in further view of Vähätalo

to a TDMA system that processes data in a TDMA time frame for removing echo in a mobile-to-mobile connection.

Claim 30 **is limited to the echo canceller of claim 29**, as covered by Laberteaux in view of Sih and in further view of Vähätalo. Therefore, the prior art makes obvious all limitations of the claim with the exception of **wherein the predetermined number of samples 160**; Pon teaches to use echo canceling in a TDMA system to prevent echo in a mobile-to-mobile connection where the number of samples used is 160 (column 8, lines 2-51). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the echo canceller of claim 29 to be used in a TDMA system using 160 samples per time frame as taught by Pon to prevent echo in a mobile-to-mobile.

Claim 42 is limited to **the echo canceller of claim 25**, as covered by Laberteaux in view of Sih and in further view of Vähätalo. Therefore, the prior art makes obvious all limitations of the claim with the exception of **wherein the communications system is a mobile communications system**; Pon teaches to use an echo canceller in a TDMA system (i.e. mobile communications system) for the purpose of removing echo in mobile-to-mobile connections (column 1, line 53 through column 2, line 27). It would have been obvious to one of ordinary skill in the art at the time of the invention to adapt the echo canceller of Laberteaux into the mobile system as taught by Pon for the purpose of removing echo in mobile-to-mobile connections.

Claim 43 is essentially the same as claim 16 and is rejected for the same reasons as of claim 16.

Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Laberteaux in view of Sih and in further view of Vähätalo as applied to claim 1 above, and further in view of Laberteaux et al. (US Patent 6,181,793).

Claim 15 is limited to **the method of claim 1**, as covered by Laberteaux in view of Sih and in further view of Vähätalo, **further comprising: selecting the trial echo-canceled output as an output**; Laberteaux "908" discloses a switch (figure 2, element 45) that allows selecting between the non-adaptive and adaptive filters as outputs. Therefore, Laberteaux "908" discloses all limitations of the claim with the exception of **where the echo-containing signal is dominated by echo and the trial energy is less than the first energy**; Laberteaux "793" teaches that when the filter is converging, which occurs in the presence of echo (i.e. when the echo-containing signal is dominated by echo) the output is selected to be the adaptive filter because it's assumed to provide a higher ERLE (i.e. lower energy) than the non-adaptive filter. It would have been obvious to one of ordinary skill in the art at the time of the invention to operate the switch of Laberteaux "908" so the adaptive filter's output is selected during convergence as taught by Laberteaux "793" for the purpose of providing the output with the greatest ERLE.

Allowable Subject Matter

Claims 9, 22, 37, and 49 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim 9 is limited to **the method of claim 4**, as covered by Laberteaux in view of Sih and in further view of Vähätalo, **wherein the second value is a baseline value, and the step of calculating the baseline value comprises calculating a Root Mean Square value of the correlation function over the portion of the correlation window where no echo is expected**. Vähätalo discloses calculating a second max after zeroing the first max so that no echo is expected across the window. Therefore, the prior art makes obvious all limitations of the claim with the exception of calculating a **Root Mean Square value of the correlation function**. Therefore, claim 9 is allowable matter.

Claim 22 is essentially the same as claim 9 and is allowable matter for the same reasons as of claim 9.

Claim 37 is essentially the same as claim 9 and is allowable matter for the same reasons as of claim 9.

Claim 49 is essentially the same as claim 9 and is allowable matter for the same reasons as of claim 9.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Walter F Briney III whose telephone number is 703-305-0347. The examiner can normally be reached on M-F 8am - 4:30pm.

MINSUN OH HARVEY
PRIMARY EXAMINER